TENTATIVE DETERMINATION TO EXTEND VARIANCE
FOR COMBINED SEWER OVERFLOW DISCHARGES
TO
LOWER CHARLES RIVER/CHARLES BASIN

FACT SHEET

This document provides some background and the basis for the decision of the Massachusetts Department of Environmental Protection ("DEP") to extend the Variance for CSO discharges by Massachusetts Water Resources Authority ("MWRA"), the City of Cambridge and Boston Water & Sewer Commission ("BWSC") to the Lower Charles River Basin for a period of three years.

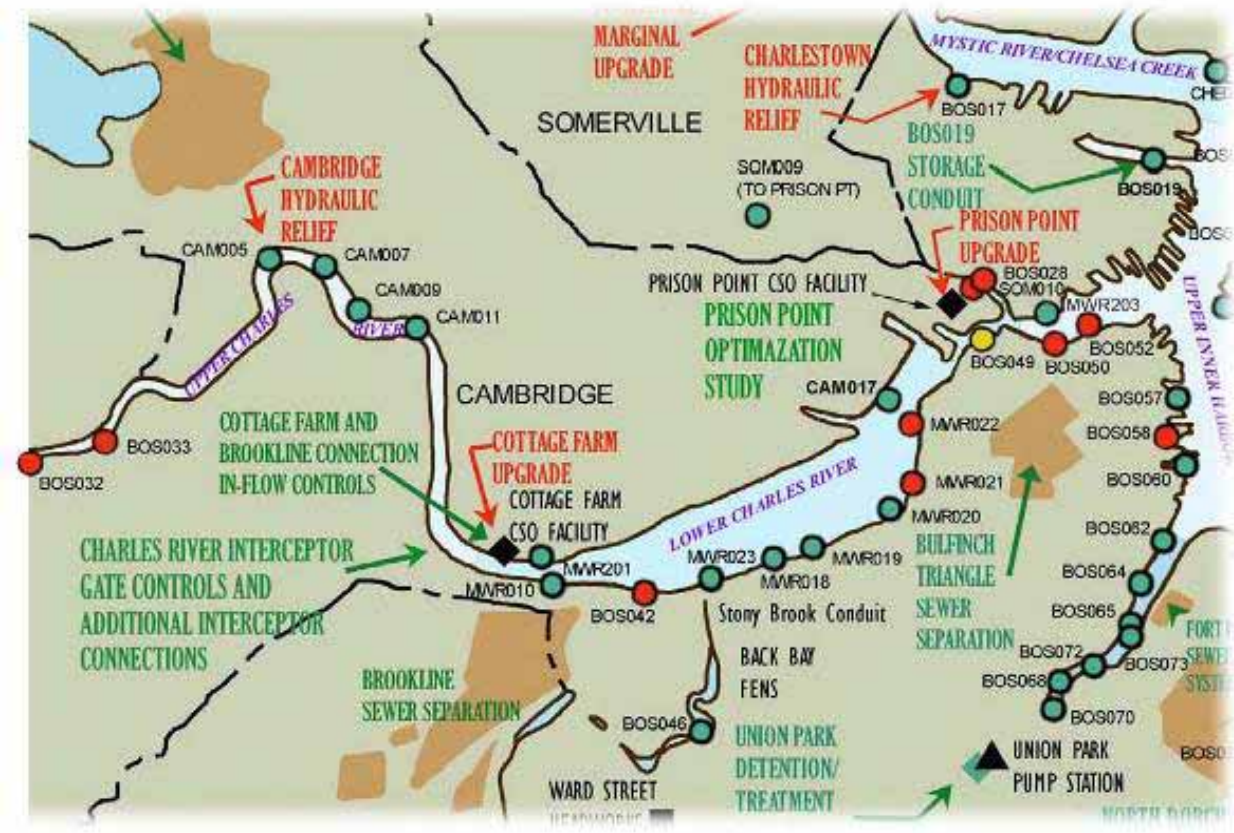
I. Present Status of CSO Abatement Work

The Massachusetts Water Resources Authority ("MWRA") produced its Final CSO Facilities Plan and Environmental Impact Report ("FEIR") in July 1997. The FEIR was the result of several years of CSO planning and underwent extensive public, regulatory, and MEPA review as part of the process. Early in the planning process, MWRA characterized the baseline conditions throughout the regional planning area, including the Charles River Basin, through a metering, sampling and modeling program. In accordance with national and Massachusetts CSO control policies, the FEIR evaluated the costs and benefits of a range of CSO alternatives in the Charles River Basin to address these discharges. Based on these evaluations and with public input, the FEIR recommended a Long-Term CSO Control Plan ("LTCP") for the Lower Charles River that included the following elements (see Figure 1):

- A $45 million sewer separation program in the Stony Brook subwatershed, which Boston Water and Sewer Commission completed in September 2006;
- A $4.5 million upgrade to the existing Cottage Farm CSO Treatment Facility, which MWRA completed in 2002.
- A $1 million project to improve hydraulic capacity in the Cambridge and MWRA collection systems at outfall CAM005, which MWRA completed in 2000.
- Region-wide floatables controls at remaining CSO outfalls, implemented by the respective permittees (MWRA, BWSC and Cambridge), which are expected to be fully implemented by December 2007.

Prior to issuing the FEIR, MWRA had greatly reduced CSO discharges system-wide, particularly in the Charles River Basin, by implementing major improvements that significantly increased conveyance, pumping and treatment capacity at and upstream of the Deer Island Wastewater Treatment Plant. These conveyance improvements were implemented at the Cottage Farm CSO treatment facility and other wet weather relief points on the Charles River. These improvements, together with the required FEIR recommended projects, contributed to the closing of seven CSO outfalls (see Figure 1) and have reduced average annual CSO volume to the Charles River by 96% from 1988 levels, from 1.74 billion gallons per year to 75 million gallons per year.

Figure 1: Charles River Basin CSO Locations and Projects



DEP and the U.S. Environmental Protection Agency's Region 1 Office ("EPA") reviewed the information in the FEIR and in early 1998 approved and required the recommended plan for the Charles River Basin to move forward. DEP and EPA decided to defer a final determination on the water quality standard and associated level of CSO control in the Lower Charles River Basin until additional information on CSO and non-CSO pollutant loads could be developed and further CSO related work implemented. DEP with the support of EPA, issued the Variance for CSO discharges to the Lower Charles River on October 1, 1998. The Variance, with extensions, expires on October 1, 2007.

The Variance and its extensions required MWRA to implement the recommended CSO plan for the Lower Charles River Basin and provide further technical analyses of water quality conditions, water quality impacts, and the cost-effectiveness of additional CSO controls, especially higher levels of control at the Cottage Farm facility. The Variance and its extensions also required the City of Cambridge and Boston Water & Sewer Commission to undertake specified CSO related work. Pursuant to the requirements of the Variance and extensions, and the applicable Court Order, since October 1998, MWRA has participated in the collection and analysis of water quality data for the Lower Charles River Basin, updated the water quality impacts of CSO and non-CSO discharge sources, and evaluated higher levels of CSO control, including additional storage and treatment enhancements at Cottage Farm, inflow removal, and system optimization measures. MWRA has recommended, and DEP and EPA have approved and required, additional CSO control projects and system optimization measures to achieve a higher level of CSO control than the level recommended in the 1997 FEIR, especially at the Cottage Farm facility. Some of the Variance-related and required tasks and results are delineated below.

II. Variance Requirements, Data and Results

The previous CSO Variance required MWRA to carry out additional CSO system and water quality analyses and to contribute funds toward a large-scale stormwater study in the Lower Charles River Basin. These requirements were intended to provide a more complete understanding of the pollutant loads from both stormwater and CSO discharges, so that a more accurate and complete review of the cost-effectiveness of CSO abatement strategies could be conducted.

Stormwater

The pollutant loads attributed to stormwater in the 1997 CSO Plan were based on limited sampling data, much of which was gathered outside of the Charles River Basin. A major focus of the Variance-related work, therefore, was to more accurately identify actual stormwater pollutant loads by gathering data in the watershed. The United States Geological Survey ("USGS"), with funding from MWRA, EPA, and DEP, undertook an extensive and detailed stormwater study in the Lower Charles River Basin, from the Watertown Dam to the New Charles River Dam at the mouth of the river.

Conclusions of the USGS work included:

- Stormwater quality in the Lower Charles River Basin is generally similar to or slightly better than that reported in other urban areas of the country.
- Event-Mean Concentrations of fecal coliform in stormwater and tributary streams ranged from 2,000 to 70,000 colonies/100ml.
- The length of the dry period antecedent to a rainfall event is a critical factor in affecting stormwater quality. The longer the antecedent dry period, the larger the stormwater pollutant loads.
- The largest single source of fecal coliform to the Lower Charles River Basin is Stony Brook, where fecal coliform loads are very large during storm events.
- Full implementation of structural Best Management Practices ("BMPs") and street sweeping in the watershed would result in an estimated 14% reduction in the fecal coliform load from stormwater.

Due to the commitment of substantial resources by EPA, DEP, Charles River Watershed Association (CRWA), and the communities in the watershed of the Lower Charles River Basin, there has been substantial progress in eliminating illegal wastewater connections to storm drains and developing "state of the art" stormwater management plans. There has been significant improvement in water quality in the River over the past five years. Though water quality during dry weather conditions is generally good, conditions continue to be impaired during wet weather events.

Cottage Farm CSO Facility Assessment Report

An early condition of the Lower Charles River Basin CSO Variance issued to MWRA, The City of Cambridge and Boston Water & Sewer Commission required MWRA to prepare and submit the Cottage Farm CSO Facility Assessment Report (the "Cottage Farm Report" or "Report"). The Report was submitted in January 2004 and underwent a lengthy public review and comment period, extending to May 2004.

Pursuant to the Variance, the Report evaluated higher levels of control in the form of additional CSO storage at the Cottage Farm facility to reduce activations and volumes at this location, which is the largest and most frequent CSO discharge to the Charles River, but which provides treatment prior to discharge. The Report also included an updated characterization of the interceptor and collector sewer system which affects combined sewer overflows at Cottage Farm, and identified specific system optimization measures to further minimize CSO volumes; and CSO alternatives were assessed using MWRA's sewer system and receiving water models. This work included both assessment of design storm events and a "typical" rainfall year to estimate the flows and water quality impacts from the three major pollutant sources: CSOs, stormwater, and upstream sources. Also pursuant to the Variance, the Report recommended specific system optimization measures to maximize the conveyance of wet weather flows to the Deer Island Wastewater Treatment Plant, minimize overflows into the Cottage Farm facility and maximize the facility's existing storage basins, which MWRA was required to implement under the conditions of the 2004 Lower Charles River/Charles Basin Variance. The Report also demonstrated the value of ongoing sewer separation work (i.e. removal of storm inflow from the combined sewer system) by the City of Cambridge and the Town of Brookline in reducing CSO discharges to the Charles River.

Improving on CSO Control with System Optimization and Inflow Removal

In August 2005, MWRA recommended adding a set of optimization measures and targeted sewer separation projects to its plan to increase the level of CSO control at Cottage Farm and at other Charles River outfalls by improving hydraulic conditions and reducing stormwater inflow. The projects included:

- Brookline Connection/Cottage Farm Overflow Chamber Interconnection and Gate Control (Figure 3)
- Charles River Valley/South Charles Relief Sewer Gates Controls and Additional Interceptor Connections (Figure 4)
- Bulfinch Triangle Sewer Separation (Figure 5)
- Brookline Sewer Separation (Figure 6)

These projects add approximately $20 million to MWRA's cost for the Charles River CSO plan (which now totals $73.3 million). The projects were incorporated into the required, revised LTCP approved by EPA and DEP in March 2006 and incorporated into Schedule Seven by the Federal District Court in the Boston Harbor Case (D. Mass. C.A. No. 85-0489) in April 2006. Together with projects in the original plan, they are predicted to reduce treated CSO discharges at the Cottage Farm facility to 2 activations and 6.3 million gallons in a typical year, compared with the 1997 goals of 7 activations and 23 million gallons. Most of the anticipated benefit would result from optimization improvements that direct more wet weather flow to MWRA's Ward St. Headworks and reduce overflows into the Cottage Farm facility. The required sewer separation projects would lower wet weather flows to the conveyance system, offsetting certain hydraulic impacts of directing more flow to the Headworks. These projects are described in detail in the *August 2, 2005 Recommendations and Proposed Schedule for Long-Term CSO Control for the Charles River, Alewife Brook, and East Boston*.

Actual and Anticipated CSO Reductions in the Lower Charles River/Charles Basin

Pursuant to the conditions of the Variance and extensions, MWRA, along with the cooperation of BWSC, Cambridge and Brookline, has made improvements to the wastewater collection and transport systems and has completed certain implementation work of the CSO control projects recommended in the 1997 FEIR. This work has reduced CSO discharges to the Charles River and allowed many CSO outfalls to be permanently closed. Based on information collected by the communities and MWRA pursuant to the Variance and extensions, MWRA has improved upon the long-term plan and predicted CSO control benefits by recommending and proceeding with additional long-term controls that primarily involve optimization of sewer system performance and reduction of stormwater inflow. MWRA predicts that these improvements will reduce the 2006 level of CSO discharge by 89%, for an overall reduction in average annual CSO volume to the Charles River Basin of 99.5% since MWRA began its CSO control efforts in the late 1980's.

Figure 2: Summary of CSO abatement resulting from MWRA's LTCP.

Annual CSO Discharge Frequency and Volume to the Charles River (for typical year rainfall)						
Outfall	Baseline Conditions (1988) [1]		Current Conditions[2]		Plan Implementation[3]	
	Activations	Volume (MG)	Activations	Volume (MG)	Activations	Volume (MG)
BOS032	4	3.17	N/A	Eliminated	N/A	Eliminated
BOS033	7	0.26	N/A	Eliminated	N/A	Eliminated
CAM005	6	9.17	4	1.60	3	0.84
CAM007	1	0.81	3	0.79	1	0.03
CAM009	19	0.19	2	0.06	2	0.01
CAM011	1	0.07	0	0.00	0	0.0
BOS028	4	0.02	N/A	Eliminated	N/A	Eliminated
BOS042	0	0.00	N/A	Eliminated	N/A	Eliminated
BOS049	1	0.01	0	0.00	N/A	Eliminated
CAM017	6	4.72	2	1.07	1	0.45
MWR010	16	0.08	0	0.00	0	0.0
MWR018	2	3.18	0	0.00	0	0.0
MWR019	2	1.32	0	0.00	0	0.0
MWR020	2	0.64	0	0.00	0	0.0
MWR021	2	0.5	N/A	Eliminated	N/A	Eliminated
MWR022	2	0.43	N/A	Eliminated	N/A	Eliminated
MWR201[4]	18+	1,547	11	61.95	2	6.3
MWR023	39	115	7	0.45	2	0.13
SOM010	18	3.38	N/A	Eliminated	N/A	Eliminated
Total		1,690 MG		68.00 MG		7.76 MG

[1] Includes major improvements to Deer Island transport and treatment system and implementation of system optimization measures (SOPs) recommended by MWRA in 1993 and 1994.

[2] From MWRA modeling of 2006 system conditions.

[3] Construction of the long-term CSO control plan for Boston Harbor and its tributaries is scheduled to be complete by December 2015, which will be followed by a period of post construction monitoring in accordance with Schedule Seven of the Boston Harbor Case.

[4] MWR201 is the effluent discharge for the Cottage Farm CSO Facility. Flows are screened, disinfected and dechlorinated prior to discharge.

Figure 3
Cottage Farm Brookline Connection and Inflow Controls

Figure 4

Optimization of Gates and Connections Between Charles River Interceptors

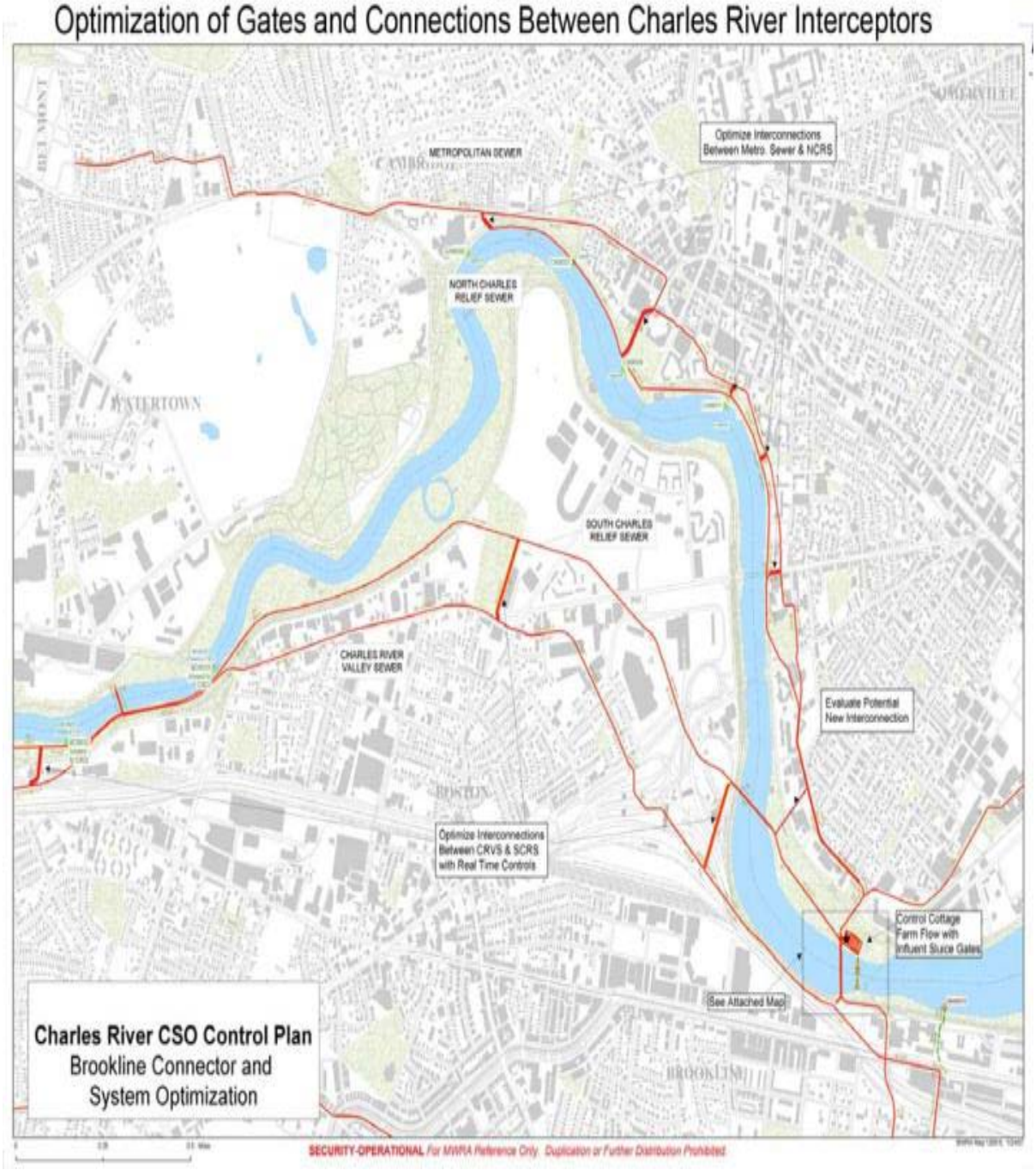


Figure 5

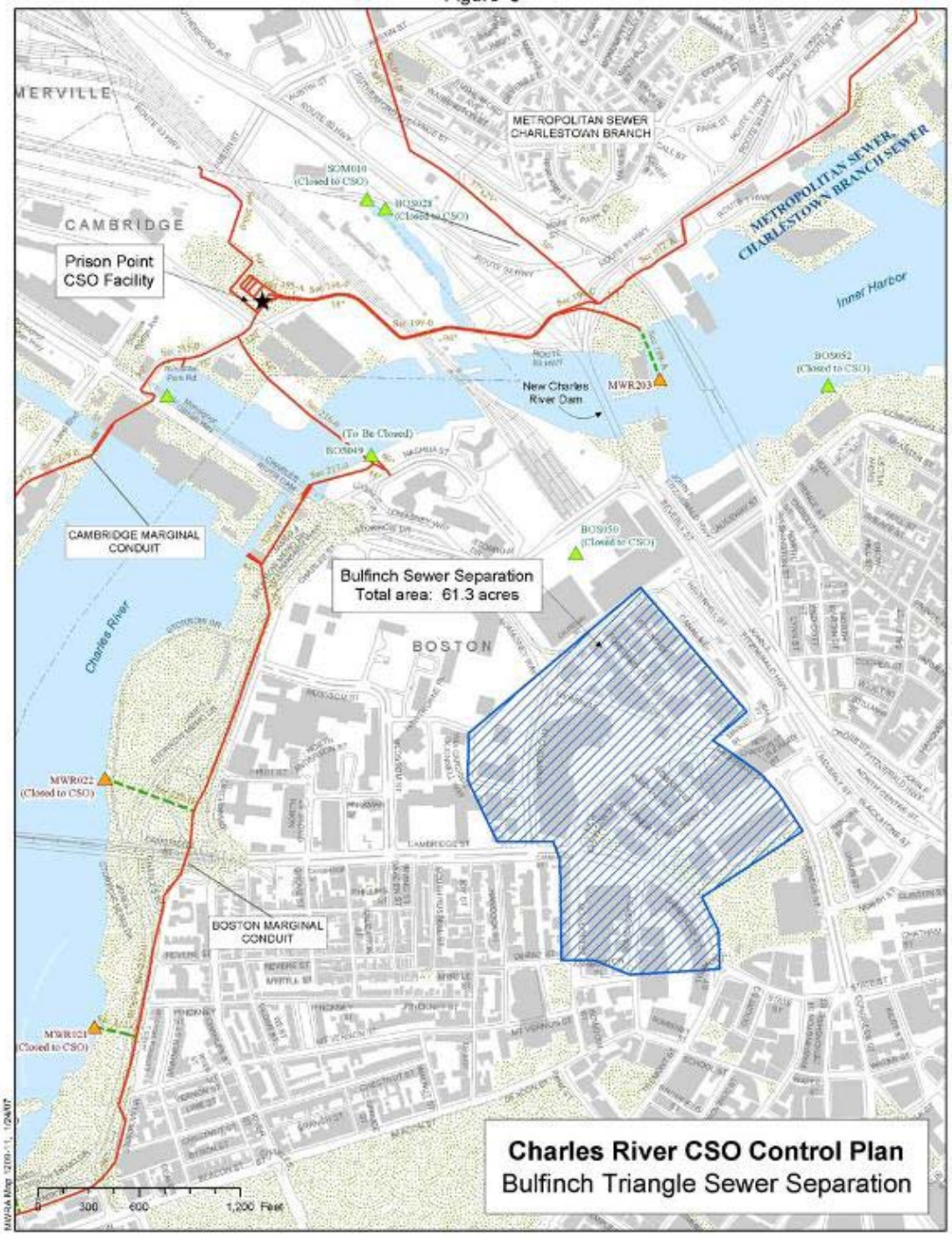
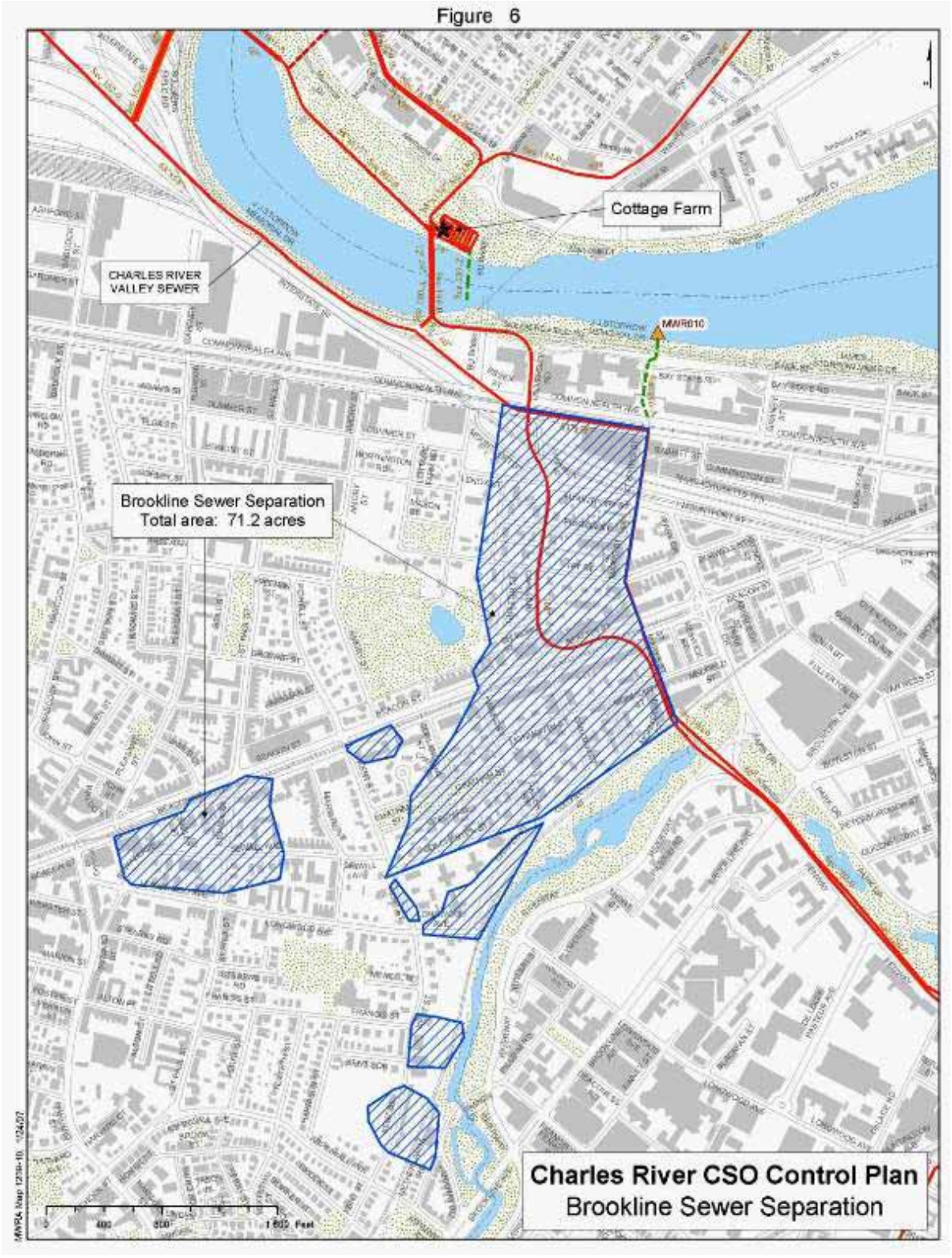

METROPOLITAN SEWER
CHARLESTOWN BRANCH
METROPOLITAN SEWER,
CHARLESTOWN BRANCH SEWER
CAMBRIDGE
Prison Point
CSO Facility
Inner Harbor
New Charles
River Dam
MWR203
BOS052
(Closed to CSO)
SOM010
(Closed to CSO)
BOS049
(To Be Closed)
BOS050
(Closed to CSO)
CAMBRIDGE MARGINAL
CONDUIT
Bulfinch Sewer Separation
Total area: 61.3 acres
Charles River
BOSTON
MWR022
(Closed to CSO)
BOSTON MARGINAL
CONDUIT
MWR021
(Closed to CSO)
0
300
600
1,200 Feet
Charles River CSO Control Plan
Bulfinch Triangle Sewer Separation

Figure 6


Cottage Farm
CHARLES RIVER VALLEY SEWER
MWR010
Brookline Sewer Separation
Total area: 71.2 acres
Charles River CSO Control Plan
Brookline Sewer Separation

Results of MWRA Water Quality Monitoring in the Charles River

MWRA has been monitoring water quality in the Charles River since 1989. Studies include measurements of sewage indicator bacteria, nutrients, and viral pathogens. Pursuant to the Variance and extensions, MWRA has submitted reports annually over the course of the Variance. The MWRA reports (e.g. Coughlin K. 2006. *Summary of CSO Receiving Water Quality Monitoring in Upper Mystic River/Alewife Brook and Charles River, 2005*. Boston: Massachusetts Water Resources Authority. Report 2006-07. 38 p.) are available at: http://www.mwra.state.ma.us/harbor/enquad/trlist.html.

There have been improvements in the level of fecal coliform bacteria in the Charles River since MWRA began implementation of the required long-term CSO control plan. Average bacteria counts during heavy rain, when the river is affected by contaminated stormwater and CSO, have decreased substantially. There have also been decreases during dry weather and light rain, when illicit connections and contaminated storm water have the largest effects, separate from the CSOs that typically only discharge in heavy rain (Figure 7).

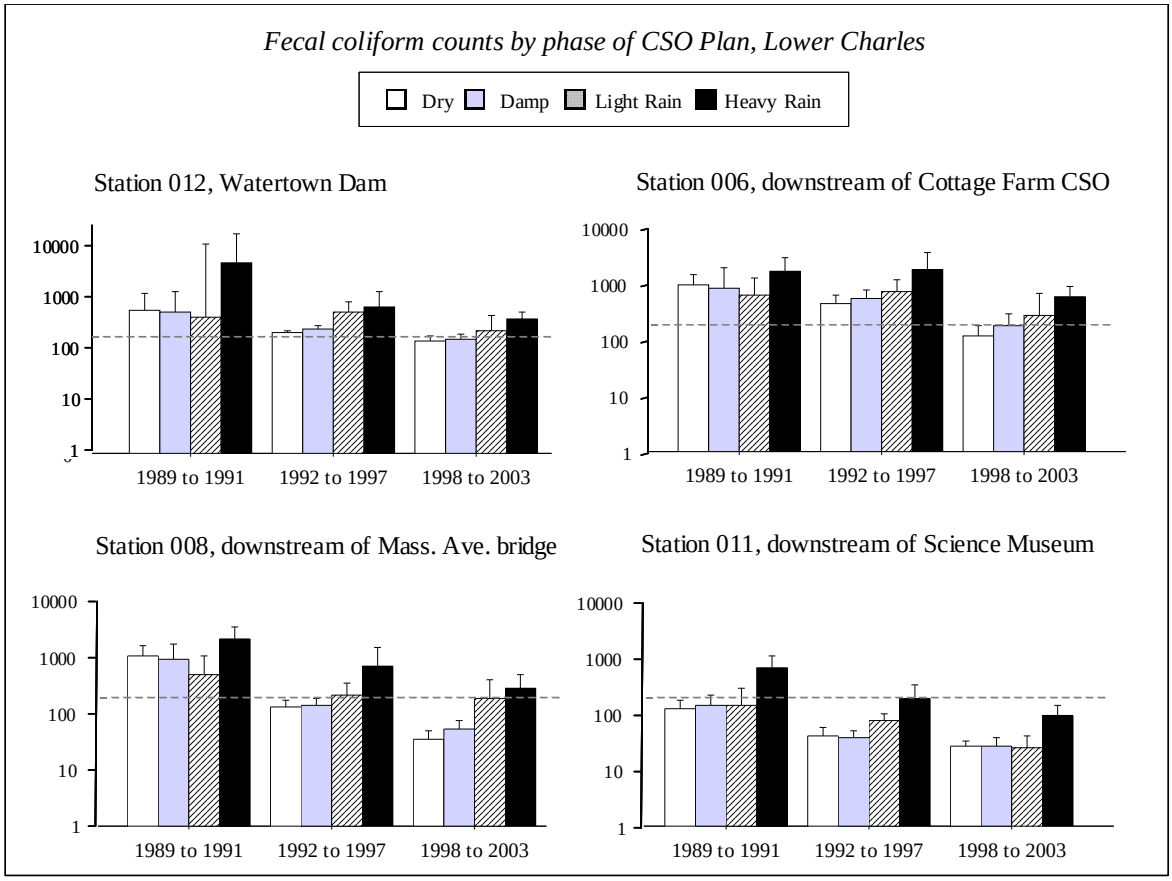


Figure 7: Average fecal coliform counts in different weather conditions and during phases of MWRA's CSO control plan at four locations in the lower Charles River. Dotted line indicates 200 fecal coliform/100 ml, the previously effective swimming standard. (Note log scale.)

III. DEP Determinations and Next Steps

MWRA Long-Term CSO Control Plan

The $73.3 million recommended plan to control CSO discharges to the Lower Charles River is part of MWRA's region-wide LTCP that addresses 84 CSO outfalls discharging to Boston Harbor and its tributaries. MWRA's capital budget for the LTCP has risen from $487 million in 1997, when MWRA issued the FEIR which was the basis for DEP's determination to issue the original CSO Variance for the Charles River on October 1, 1998, to $811 million in MWRA's current Capital Improvement Program. Much of the additional cost is due to enhancements to the plan that increase the level of CSO control or overcome site-specific hurdles to maintain the recommended levels of control. Following issuance of the FEIR, site-specific issues led MWRA to conduct reassessments of several of the recommended projects in order to ensure that required CSO goals would be met. Pursuant to the Variance and extensions, MWRA also conducted investigations to improve upon the level of CSO control for the Charles River.

In August 2005, MWRA recommended a revised LTCP that included $20 million of additional projects and associated higher level of control for the Lower Charles River Basin. In March 2006, MWRA reached agreement with EPA, DEP and the U.S. Department of Justice ("DOJ") on the plan and a new schedule. The agreement was filed with the Court as part of a joint motion to amend the court schedule.

In April 2006, the Court allowed the joint motion and issued an Order with a new schedule. Under the Order, MWRA has until the year 2020 to complete the remaining CSO work and subsequent monitoring to verify that the long-term CSO control goals are achieved. In addition, the United States and MWRA agreed to withdraw the February 27, 1987 Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows and replace it with a Second Stipulation that requires MWRA to implement the CSO requirements set forth in the court schedule and to meet the levels of control described in MWRA's LTCP. In July 2006, the Court accepted revisions to Schedule Six incorporating a new Schedule Seven. The revisions include modified or additional milestones for projects in the Alewife Brook, Charles River and East Boston CSO plans.

Charles River CSO Plan and Related Water Quality Improvement

Water quality in the Lower Charles River Basin has improved over the last decade, in part due to significant reductions in CSO discharges at the Cottage Farm facility and several other outfalls. Greatly improved pumping capacity at the Deer Island Wastewater Treatment Plant, improved sewer system operation and maintenance, and the required implementation of projects under the LTCP have contributed to the CSO reductions. The completed CSO work includes Stony Brook sewer separation; hydraulic relief at outfall CAM005; upgrade of the Cottage Farm facility; the closing of several outfalls by MWRA and BWSC; and floatables control. In addition, MWRA, with the cooperation of BWSC and the Town of Brookline, is now moving forward with additional projects that are intended to further reduce CSO discharges by optimizing the existing sewer system and reducing stormwater inflows. In addition, the City of Cambridge continues to implement its long-term plans for separation of its combined sewer systems in the Charles River watershed.

Substantial and Widespread Social and Economic Impact

DEP has emphasized cost-effectiveness for CSO long-term control plans, to ensure that financial resources for pollution abatement actually provide improvements in water quality. The principles of cost-effectiveness and water quality benefits have been a major factor used by MWRA in the development of its present $811 million CSO abatement plan. MWRA will spend more than $400 million on CSO projects over the next eight years (2007-2015), which is 29% of all planned capital spending and 53% of wastewater capital spending in the same period. MWRA sewer rates are among the highest in the nation and are projected to increase significantly over the next eight years.

Implementation of the revised recommended plan should reduce the untreated CSO discharges to the Charles River to three or fewer per year on average, and should reduce the number of treated CSOs discharged at Cottage Farm to two activations per year. In accordance with DEP's CSO Guidance, cost-effectiveness, protection of sensitive uses, and the financial capability of CSO permittees are all important factors in making determinations on the appropriate level of CSO control.

MWRA has submitted data related to DEP's finding of "substantial and widespread economic and social impact," the basis for its issuance of a Variance in 1997 (See 314 CMR 4.03(4)(f)), including a report by Robert N. Stavins, Assessment of the Economic Impact of Additional Combined Sewer Overflow Controls on Households and Communities in the Massachusetts Water Resources Service Area, dated March 17, 2004. DEP also reviewed the Affordability Analysis Worksheets included in Appendix H of the Cottage Farm Report dated January 2004, which are based on EPA's Interim Economic Guidance for Water Quality Standards.

DEP's conclusions from its review of the documents submitted by MWRA and determination in support of the Variance request have not changed. DEP, upon issuance of the 2004 Variance extension, indicated that it would evaluate the information required by the Variance to determine whether there are additional cost-effective CSO controls. DEP has reviewed the new information regarding revisions to the Charles River CSO plan, as well as other revisions and cost changes in MWRA's LTCP, and has determined that additional controls beyond those recommended in the MWRA CSO Plan would not be feasible at this time.

DEP has determined that proceeding at this time with controls beyond those included in the MWRA Long-Term CSO Control Plan would result in substantial and widespread social and economic impact as specified in 314 CMR 4.03(4), and that an extension to the CSO Variance is appropriate at this time. Issuing of the CSO Variance for the Lower Charles River Basin is consistent with EPA Guidance: *Coordinating CSO Long-Term Planning with Water Quality Standard Reviews (July 31, 2001)*, which states that longer term variances and renewal of variances are warranted given the extended duration necessary for implementation of LTCPs.

IV. CSO Variance Extension

As part of the agreement on the LTCP reached in March 2006 among EPA, DEP, DOJ and MWRA, MWRA requested that the Variance for the Lower Charles River Basin be reissued through 2020 when MWRA must complete the region-wide LTCP and subsequent monitoring to verify that the long-term CSO control goals are achieved. According to MWRA, the requests were based on the significance of the CSO control and related water quality improvement it achieved to date, the expectation for additional CSO control and water quality improvement with the projects added to the Charles River plan as part of the 2006 decision, and the desire to provide a level of financial certainty and stability for its ratepayers.

Determination to Extend Variance

DEP makes the following determinations:

- The revisions MWRA has made to its long-term CSO control plan for the Charles River, by adding projects to optimize sewer system performance and remove stormwater inflow through sewer separation, are responsive to the conditions and intent of the Variance and will maximize CSO control benefits.

- CSO discharges in the Lower Charles River Basin cannot be feasibly eliminated at this time. MWRA has completed numerous analyses since the late 1980s evaluating alternatives for eliminating CSOs from the collection system tributary to the Deer Island Wastewater Treatment Plant. Among these are the 1997 FEIR, the 2004 Cottage Farm Report, and the additional alternatives analyses and recommendations MWRA submitted to EPA and DEP in late 2005 and early 2006 that led to the 2006 agreement. MWRA's revised LTCP incorporates cost-effective and feasible CSO abatement projects for the Lower Charles River Basin at this time. At this time, it does not appear feasible to eliminate all CSO outfalls to this watershed given the engineering and infrastructure constraints in the MWRA interceptor system, headworks, conveyance tunnels, the Deer Island Wastewater Treatment Plant, and the ocean outfall.

- Proceeding at this time with controls beyond those presently included in the revised LTCP would result in substantial and widespread social and economic impact as specified in 314 CMR 4.03(4). The cost of MWRA's CSO control program is substantial, at present included in MWRA's capital budget at $811 million and estimated by MWRA to ultimately cost $864 million to complete the plan on schedule, including escalation to the mid-point of construction and contingency. MWRA's detailed financial impact assessment considered the effect of expected sewer rate increases, and, appropriately, median household income as adjusted by the relatively high cost of housing in the Boston area. The MWRA has adequately demonstrated that proceeding at this time with CSO controls necessary for full attainment of Class B uses and associated water quality standards in the Lower Charles River Basin would result in substantial and widespread economic and social impact.

DEP concludes that extension to the Variance for CSO discharges to the Lower Charles River Basin is appropriate at this time, and extends the Variance for MWRA, BWSC, and the City of Cambridge to October 1, 2010.